# Near-Term Diagnostics Improvements Needed For Reliability and Performance Enhancements

# Storage Ring Diagnostics (MS#1)

1. Broadband rf BPM System hardware -
   - Unreliable fast beam history module
   - Boxcar averager occasionally misbehaves
   - Boxcar averager is a bad digital filter
   - Cost-benefit analysis of various upgrade paths in progress

2. Rogue microwave mode -
   - affects vertical readbacks on large aperture (42 mm x 84 mm) vacuum chambers

3. Xbpms upgrade -
   - Need to upgrade translation stages - not reliable in few cases
   - Need to redesign P2 ID x-bpm blade geometry
   - Design of x-bpms for dual-undulator sources

4. Centering of the beam in BPLD window
   - to reduce beam trips

5. Eliminate bunch train gap
   - Study in progress to fill 24 bunches

6. S35-ID and BM Photon Diagnostics
   - Complete installation and commission of Cryogenic monochromator
   - Make ID divergence and source beam image available on-line
   - Develop high resolution x-ray imaging
   - Maintain and upgrade 35 BM pin-hole camera
   - Support injection study, capturing single bunch image
   - Develop in-tunnel pin-hole camera
   - Maintain/upgrade bunch purity measurement
   - Make energy-spread measurement

# Beam Stability (MS#2)

1. Implement “Data Pool” IOC
   - Allow “DC” orbit correction at 20 - 50 Hz,
   - Feedforward on ID gaps will become practical, reducing transient effects to other users

2. Implement ID x-bpms into DC orbit correction

3. Integrate x-bpms and narrowband bpm’s data into RTFB (1.5 kHz) system

4. Implement ID and BM x-ray bpm's for steering

5. Complete complement of narrowband bpms

6. Regulate rf frequency with RTFB system to eliminate 360 Hz phase modulation sideband

7. Regulate coupling

8. Develop user interface screen to provide Beamline Source point data

# Injector Diagnostics (MS #3 and #4)

1. Linac BPM's Front-End Electronics
   - Not modularized
   - Unreliable and difficult to repair/maintain
   - Development of prototype in progress

2. LTP and BTS BPM's
   - Front-end electronics (printed circuit) not matched with SL signal,
   - Poor performance, noise level upto 0.5 mm
   - Present design causes problems for interleave and Top-up
   - A prototype in test in BTS line

3. Linac and transport line flags
   - Present chromox screen has poor resolution/ response time
   - Limited field of view, calibration issues
   - CID Cameras are aging and have control issues
   - Upgrade discussions are in progress
   - Goal is to provide several non-destructive flags for Linac
   - BTS needs quantitative diagnostis flags for matching

# Develop Non-Intercepting Injector Photon Diagnostics

- Will allow to observe beam parameters during injection -could be a key diagnostics to maintain high injection efficiency in top-up mode

1. Non-interceptive measurements of Linac Beam
   - Make use of OSR from BC chicane bend
   - Provide beam Centroid and Size measurements
   - Provide capability of bunch to bunch data

2. Non-intercepting measurements of BTS beam
   - Make use of ODR technique, beam through/by aperture, slits, edges
   - Or use OTR technique by inserting thin foil
   - Provide beam Centroid and Size measurements

3. Ring Septum Flag
   - A thin flag for minimal (injection-through) intercepting monitor